

# 13. How Is Low-level Radioactive Waste Transported?

Low-level radioactive waste is generated by nuclear power plants, industries, universities, and hospitals throughout the United States. The waste is shipped to available low-level waste processing and disposal sites, primarily by truck in containers designed for transportation of low-level waste.

Transportation of low-level radioactive waste is regulated primarily by two government agencies: the U.S. Department of Transportation (USDOT) under authority of the 1974 Transportation Safety Act, and the Nuclear Regulatory Commission (NRC) under authority of the Atomic Energy Act of 1954 and the Energy Recovery Act of 1974. The regulations are found in the **Code of Federal Regulations (CFR)**.

In New Jersey, the Department of Environmental Protection also has a role in the shipment of radioactive materials, particularly with respect to accident reporting and accident response.

This Fact Sheet outlines the principal regulations governing the transportation of low-level radioactive waste.

## U.S. Department of Transportation

The USDOT specifies regulations for container safety, labeling, routing, and emergency response for the transportation of radioactive materials, including low-level radioactive waste. The regulations can be found in the Hazardous Materials section of Title 49 of the CFR. These regulations deal with the following issues:

### ► Container Safety

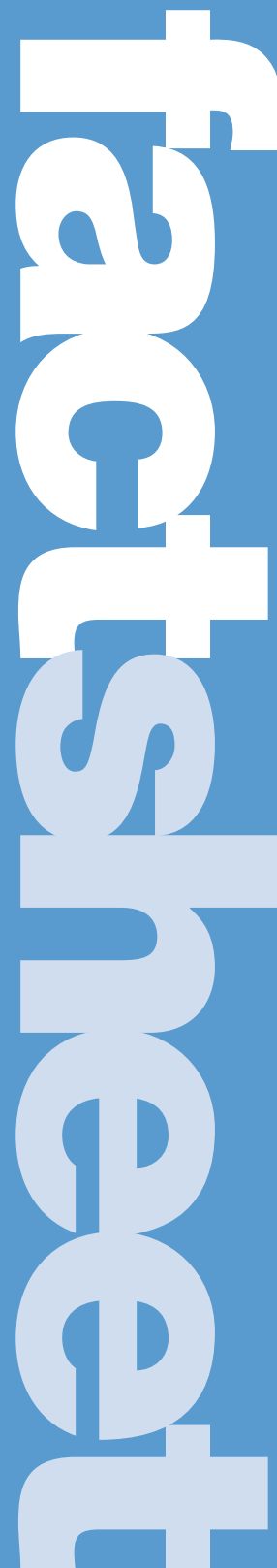
Radioactive materials must be packaged for transportation in one of four types of containers. All containers must meet USDOT General Design requirements. Materials with very low radiation levels may be transported in what the regulations refer to as a **strong, tight**

**container** such as a plywood box secured with steel bands. Materials with higher radiation levels must be shipped in Type A or Type B containers. These must meet more stringent requirements before they can be used to transport radioactive materials. **Type A containers** are typically steel drums or steel boxes. **Type B containers** are heavy engineered metal casks. U.S. DOT has recently authorized the use of an **Industrial Package** for the shipment of materials with low concentrations of radioactivity.

Rigorous testing of containers is required to ensure the safe transportation of radioactive materials. Tests for Type A containers simulate normal and rough transportation conditions while those for Type B containers simulate both normal and severe accident conditions. The reason for the difference in testing is that the amount of radioactive material allowed in a Type A container is so low that a radiation hazard is unlikely, even if a Type A container did break open in an accident. Tests of Types A and B containers include using a water spray to simulate a severe rainstorm and dropping the container from prescribed heights (free drop). Tests for Type A and Type B containers are explained in Table 1.

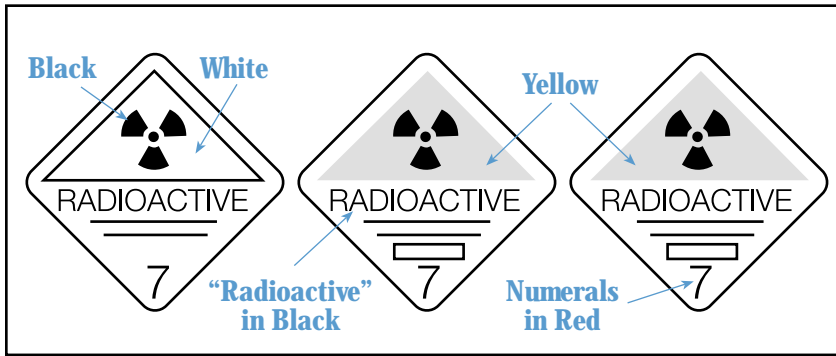
## Nuclear Regulatory Commission

Type B containers for transportation must meet not only the U.S. DOT's requirements, but also those of the NRC. The NRC regulations specify tests for Type B containers. The regulations can be found in the Packaging and Transportation of Radioactive Material section of the CFR. Tests required by the NRC simulate both normal conditions of transport and hypothetical accident conditions (see Table 1). Type B containers must pass these tests to be approved by the NRC.



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**Figure 1. Labels for Shipments of Low-Level Radioactive Waste**

### ► Labeling

The U.S. DOT provides a clear and simple system for labeling low-level radioactive waste for transportation. The containers are labeled I (white), II (yellow with black lettering), and III (yellow with red letters) (see Figure 1). The higher the number, the greater the precautions required for safety during transportation. Depending on the types of package carried, labels are also placed on the exterior of the truck in a prominent position.

### ► Routing

Routing of shipments of radioactive materials, including low-level radioactive waste is regulated by USDOT and NRC. Shipments must meet the following requirements:

- motor vehicles must travel on routes that minimize radiological risk;
- available information on accident rates, transit time, population density and activities, and the time of day and day of week are used to determine the level of radiological risk;
- the route is specified and the vehicle operator must have had formal training as part of the shipping company's radiation protection program, whose quality and adequacy have been evaluated by NRC and DOT;
- an Interstate Highway System bypass or beltway around a city must be used when available.

### ► Emergency Response Information

All parties involved in the transportation of radioactive material must maintain information that is pertinent in the event of an emergency. This information includes descriptions of the radioactive material, any special health concerns, and procedures to be used in an emergency. The waste generator must maintain a 24-hour telephone number monitored by qualified emergency response personnel. In addition, transporters of radioactive materials must train their employees on how to respond to a spill or accident.

### ► Regulation Enforcement

The U.S. DOT uses an “audit program” to enforce regulations specified for the transportation of radioactive materials including low-level radioactive waste. Companies transporting this waste are accorded a safety rating based on inspection results, accident record, and the size and number of vehicles. On the basis of the safety rating, the U.S. DOT prioritizes its audits of transportation companies to enforce the regulations specified in the Code of Federal Regulations.

In some states, including New Jersey, the U.S. DOT allows the NRC to inspect shippers of radioactive materials for compliance with DOT shipping regulations. This agreement helps to ensure that radioactive materials will continue to be shipped safely.

### ► Safety Record

There are approximately 100 million shipments of hazardous materials annually in the United States, of which 2 million involve radioactive materials and 11,000 low-level radioactive waste. According to a DOT study, during the 20-year period from 1971 to 1991 there were 53 accidents reported involving transportation of low-level radioactive waste in the United States. In only four of those accidents were the containers breached. They were quickly cleaned up with no increase in background levels at the accident site. To

Test	Explanation	Container Type
Water Spray	Simulates rainfall	A + B
Temperature	Between -40 and 100 degrees Fahrenheit	A
Compression	A weight 5 times as heavy as the package sits on top of the package for 24 hours	A + B
Free Drop	Package is dropped 1 to 4 feet, depending on weight of package	A
Penetration	A 13 pound 1.25-inch diameter steel cylinder is dropped on the package from a height of 40 inches	A
Vibration	Simulates normal transportation vibration	A + B
Pressure	Tested in both increased and decreased external pressures	A + B
Free Drop	Package is dropped 30 feet onto an unyielding surface	B
Puncture	Package is dropped 40 inches onto a steel bar in a vertical position	B
Heat	30 minutes at a temperature of 1475 degrees Fahrenheit	B
Immersion	Under 50 feet of water for 8 hours	B

**Table 1. Tests of Containers Used to Ship Low-Level Radioactive Waste**

date no radiological related injuries or deaths have occurred as a result of low-level radioactive waste transportation accidents.

### ► Accident Reporting - Federal

The NRC must be notified if significant package deterioration occurs during transportation. An example would be a closed package that has surface contamination exceeding 22 disintegrations/minute/square centimeter.

The National Response Center must be notified when an accident causes injury, hospitalization or death.

### ► Accident Reporting - New Jersey

The New Jersey DEP is also involved in regulating the transportation of radioactive material. If an accident involving radioactive material should occur, specially trained DEP personnel will respond to the incident and conduct an investigation.

### ► Accident Response

Response to transportation accidents, and their remediation, is the responsibility of the shipper. The actual clean-up would be directed by whichever local state and federal agencies respond.

In New Jersey, the county HAZMAT team is typically summoned by DEP to respond to all major accidents involving hazardous material. In addition, the NJDEP Radioactive Materials Assessment Team (RAMRAT) is on call 24 hours a day to respond to any accident involving radioactive materials.

As part of Superfund legislation, the responsibility for planning for transportation accidents was given to the State Police, Office of Emergency Management, which formed community "Local Emergency Planning Councils." Each council is required to establish a Local Emergency Planning Committee and devise an emergency plan, to address radiological emergencies, including transportation accidents, which may occur within the Council's jurisdiction.

The State Police conducts training courses dealing with radiation safety for various state, county and municipal emergency responders.

The New Jersey Low-Level Radioactive Waste Disposal Facility Siting Act provides funds to county and local emergency response teams for training and equipment once a site for the facility is selected. Disposal facility personnel will also be trained and available to provide emergency response assistance.

➤ **For More Information**

If you would like to read more about the transportation of radioactive materials, some of the references listed below might be helpful.

- Code of Federal Regulations, Title 10, Part 71, Packaging and Transportation of Radioactive Material, 1992. (Nuclear Regulatory Commission regulations)
- Code of Federal Regulations, Title 49, Part 173, Subpart I, Radioactive Materials, 1992. (Department of Transportation regulations)
- New Jersey Low-Level Radioactive Waste Disposal Facility Siting Board, Transporting Radioactive Materials in New Jersey, Nov. 1996.

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